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## DISEASES OF THE ROSE IN ARIZONA

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### Symptoms of Rose Diseases; Methods of Control; Cultural Practices and Resistant Types Discussed

THE rose is very popular in Arizona and elsewhere both as an ornamental and for cut flowers. The climate of Southern Arizona while in many respects favorable to the successful culture of roses, is in certain other respects unfavorable. The diseases and other factors causing poor growth in our state are correlated very closely with the type of climate we enjoy. Many of the most serious rose diseases, such as black spot, brand canker and leaf spot, have never been found in Arizona, and others serious elsewhere are not important here. There are, however, enough diseases which are obvious or important to call forth frequent requests for help from the Experiment Station. In order to enable rose growers to recognize the various diseases prevalent in Arizona and to apply control measures intelligently this article is written.

#### Powdery Mildew

Powdery mildew is one of the most common rose diseases in Arizona, in fact it can usually be found in rose gardens of any size. The powdery, whitish spots which are made up of chains of small colorless spores, the "seeds" of the fungus, appear on the foliage as soon as the leaves begin to develop in the spring. It spreads very rapidly in warm, damp weather but is usually checked by hot, dry weather in June.

Nearly all types of roses are susceptible but in our climate many escape serious injury. Crimson Rambler and Dorothy Perkins, both climbing roses, are so badly injured by mildew that they had better be discarded and replaced by one of our many excellent climbers which is resistant to mildew. Climbing Cecile Brunner, which has tiny pink blossoms, is a more vigorous grower than the Rambler and free from mildew. Paul's Scarlet (intense red), Climbing Kaiserin (creamy white), Climbing American Beauty, (deep pink), and Climbing Sunburst, (yel-

low, shaped copper) are likewise strong growers and not injured by mildew.

In very susceptible roses the powdery infection may spread over the leaves, young shoots, thorns, pedicels and unopened buds, resulting in a drying and shedding of the foliage, unopened buds, or the failure of buds to open properly. The plant is rarely killed by mildew but its value as an ornamental is destroyed. Many of our best roses are only moderately or slightly susceptible to mildew and these can be protected by the application of sulphur.

The best fungicide for home gardens is a mixture of 9 parts of dusting sulphur and 1 part of dry lead arsenate. Dusting sulphur is much superior to the coarser flowers of sulphur and less expensive as it covers a greater area per pound. The lead arsenate will control leaf-chewing insects and improves the physical texture of the dust because it prevents lumping and increases the adhesive power. Small hand dusters costing less than a dollar will apply the dust to the home garden in a few minutes. Special attention should be given to securing an even distribution of dust and the application should not be heavy enough to show plainly.

The secret of success is to begin before the mildew appears, when the first leaves unfold. The applications should be repeated at intervals of 10 to 14 days until June.

#### Crown Gall

Rose bushes which are stunted or in a dying condition when cultural conditions are favorable for a healthy growth, may be suspected of having crown gall. They should be examined for rough woody galls or swellings usually at or near the ground line, or on the roots, but sometimes found on the canes some distance above ground. The infections first show as small seedlings which increase in size slowly, and in fact may escape

notice until the plant finally dies some years later. The disease is bacterial and the organism does not kill the cells it invades but stimulates them to abnormal growth.

It is usually impractical to attempt to remove the galls from rose bushes which have been set for some time. The best method of treatment is to remove and burn the diseased bushes, and in case new roses are set in the same place the infected soil should be removed from the vicinity and replaced by new soil.

Infection takes place only through wounds, so care should be taken in handling nursery stock. Since infected nursery stock is the most common means by which crown gall is spread, all new plants should have the roots, inspected before planting, and those having suspicious lumps or swellings should be rejected.

#### Texas Root Rot

Rose bushes which are apparently healthy and thriving and then suddenly die in one or two days during the months of June to September inclusive may be suspected of having Texas root rot, a fungus disease which attacks a large number of our ornamentals, shade trees and shrubs. Since the disease does not become evident until it has destroyed so much of the root system that the plant dies from lack of water, it is not possible to save an infected plant.

If the dead plant is dug up and the roots carefully examined the presence of delicate strands of buff colored fungus filaments on the surface of the roots will establish the disease as Texas root rot. In case of doubt it is advisable to refer the specimen to Department of Plant Pathology for examination. During the summer months the fungus may appear on the surface of the ground as white mats of fungus filaments which within two or three days turn to buff colored spore masses. These

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are found especially after rains or where the soil is moist on the surface.

Root rot is a most difficult disease to control as it persists in the soil for years and attacks so many other plants—even weeds. It advances through the soil so that an infected spot becomes the center of an area which spreads in every direction and endangers the entire planting. The only possible methods of control in rose garden are either to remove the infected soil or to treat the soil chemically to destroy the root rot organism. The principal difficulty is in determining the exact area of infection and determining the area which it is necessary to treat. The area increases very rapidly as the radius from the point of infection is increased—an eight foot circle has four times the area of a four foot circle, and the radius has been increased only two feet. Since the cost of treatment is in proportion to the area, it is necessary to limit the area treated.

Removal of the soil to a depth of

three feet is perhaps the best method where the area infected is small. It is especially recommended where the soil is not particularly good in texture and fertility as it gives an opportunity to replace it with a deep layer of fertile soil which will grow excellent roses.

The best method of applying chemical to destroy the fungus is to remove the soil to a depth of 18 to 24 inches and apply a 5 percent solution of commercial sulphuric acid at the rate of one gallon per square foot to the bottom of the hole. When this has soaked in, replace half the soil and treat this with more 5 percent solution—one-half gallon to the square foot, and repeat with the remainder of the soil. In diluting acid, always pour the acid slowly into the water stirring constantly. The solution will corrode metal containers—use wood, glass or stoneware.

### Stem Canker

This fungus disease while not common has been found in the state. The first symptoms are small pale-yellow or reddish spots on the bark which gradually increase in size. Both bark and wood become dry and cracked forming a canker which often girdles and kills the stem.

The best method of control is the pruning out and burning of all infected parts, and the painting of all pruning wounds as infection usually occurs at that point. Sprays are of little value.

### Brown Canker

This disease resembles stem canker on the stems but may also attack leaves and blossoms. The cankers are a darker brown and may have a purplish margin.

The pruning and burning of infected parts is recommended. It may be necessary to spray the bushes with Bordeaux mixture 4-4-50 to protect foliage and blossoms from infection by small cankers which have been overlooked.

### Blossom Blights

In some seasons the blossoms of certain varieties will show a soft rot of the outer petals which spoils the blossoms. This usually occurs following rains and there is no known method of control. Often the outer petals will dry out and harden preventing the blossom from opening properly.

White and other light-colored roses are sometimes disfigured by brownish lesions on the petals, especially at the base. If the injury

is severe the blossom will not open. This injury is caused by thrips, small sucking insects, and the Entomologist can suggest control measures.

### Foliage Defects

**Chlorosis**—Rose bushes showing a yellowing or chlorosis of the foliage are usually suffering from poor drainage, excess moisture, poor soil, or excessive amounts of fresh manure. Bushes set in small holes dug in a hard caliche formation often show this condition. It will be necessary to determine which cause is operating before a remedy can be recommended.

**Shedding of foliage**—Loss of foliage during July and August is not always a sign of disease but often a characteristic of certain varieties when grown in a hot climate. Some growers recommend that application of water be reduced and the plants allowed to become dormant during midsummer. They claim that better growth is secured than when the plant is forced throughout the summer.

There is also a partial or total loss of foliage in some varieties during the coldest part of winter, the usual dormant season.

In some varieties which do not shed their leaves in summer, the foliage develops a bronze to blackish discoloration which is often mistaken for symptoms of disease, but is due to weathering of the leaves under the hot sun.

## ORCHARD HEATING IN ARIZONA

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fer of heat by radiation occurs at the speed of light while conduction is a slow process.

During a clear, calm day the radiant heat from the sun heats the ground surface until its temperature is higher than that of the air in contact with it. As soon as this occurs, heat is slowly conducted from the ground into the surface layer of air, which soon becomes warmer than the air at higher elevations. Warm air being lighter than the cold air, a circulation is thus established, in which cool upper air is progressively brought into contact with the warmer ground, heated by conduction, and then forced upward to make room for more cool air. By sunset the air to a height of 300 to 1000 feet has been heated to some

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